John Glenn
Biomedical Engineering Consortium

Microminiature Monitor for Vital Electrolyte and Metabolite Levels of Astronauts

Status Report

Accomplishments:

- Status:

Composition of the K^+-sensing compartment has been optimized and it is now fully functional within the physiological range expected in the interstitial fluid (ISF). Initial testing of a 4-compartment sensor is underway.

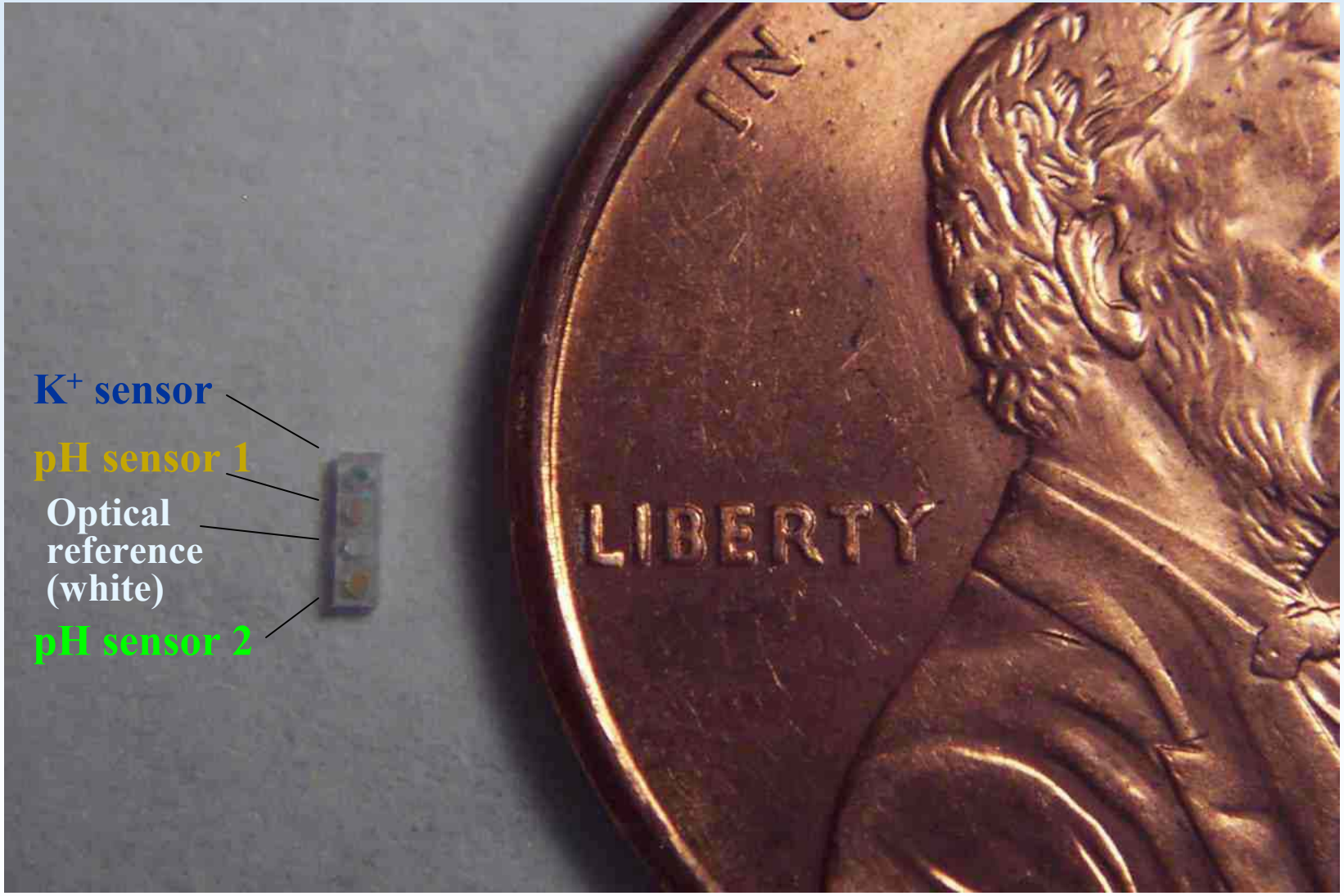
- Progress versus scheduled activities:

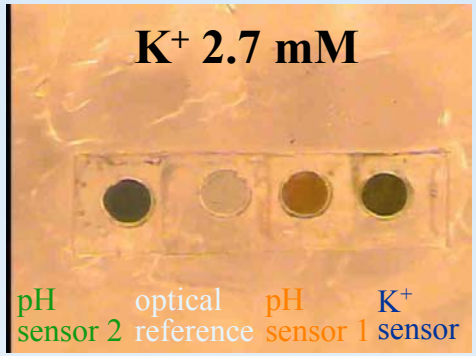
The results scheduled for the 2nd quarter have been achieved.

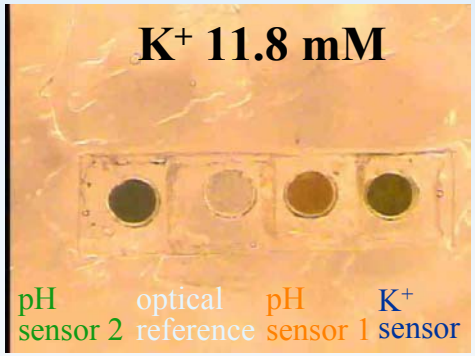
- Milestones achieved:

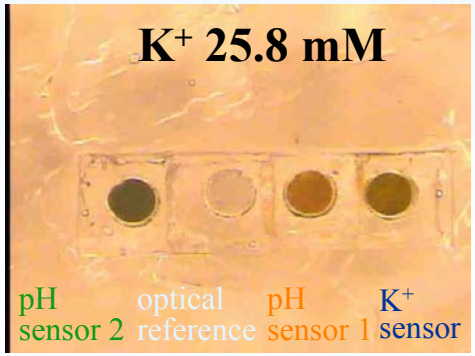
pH and K^+ can now be monitored with microscopic color compartments made entirely of plastic materials. Biocompatibility is currently being examined in mice and rats in preliminary tests.

Initial design of a 4-compartment sensor

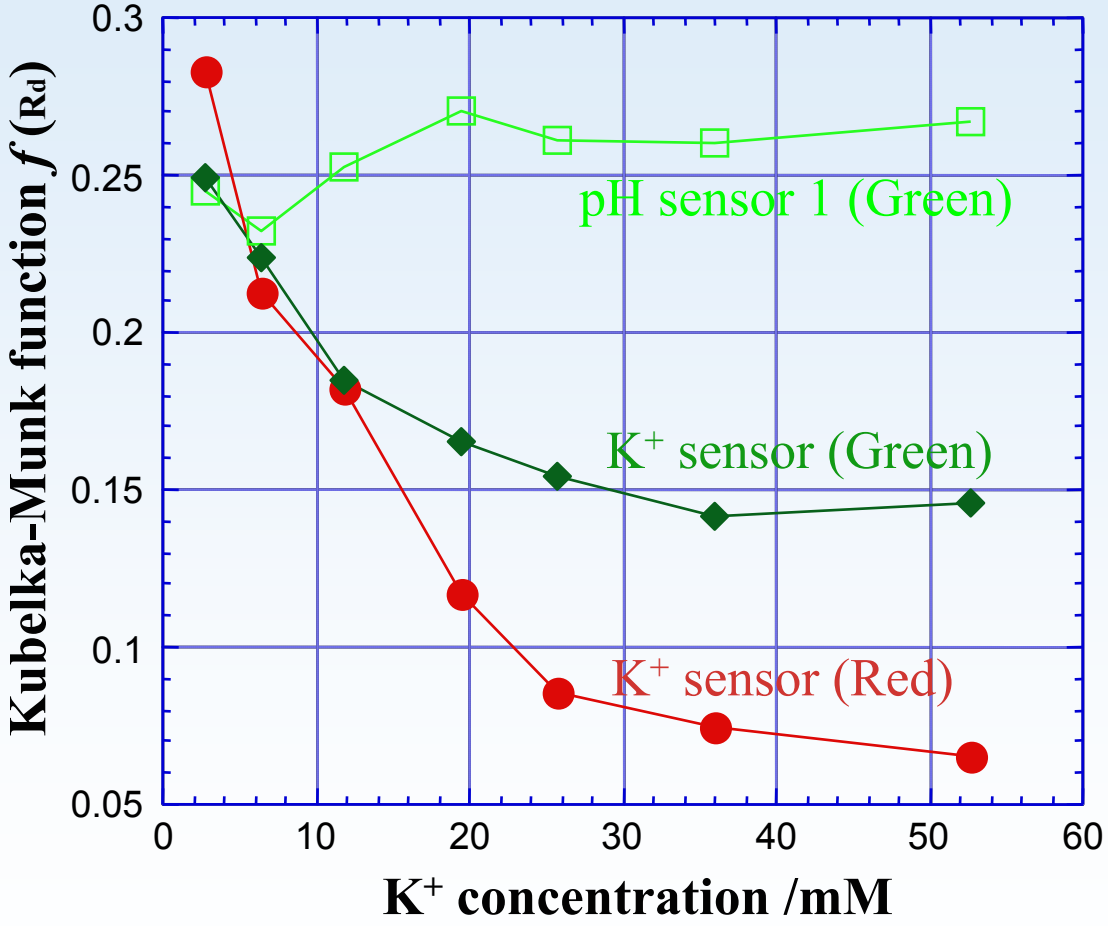








In vitro K^+ responses of a microminiature monitor



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Publications/Presentations/Invited Lectures:

- K. Tohda, M. Gratzl: A microscopic, continuous, optical monitor for interstitial electrolytes and glucose. J.Chem.Phys.Chem. 4, Vol. 2, pp. 155-160, 2003. *Invited feature article, with invited cover picture of the journal issue.*
- Three invited lectures at national and international conferences and two invited seminars at universities.

Future Work:

- Near term: design, make and test *in vitro* an optimized glucose sensing optical compartment.
- Mid-term: devise and test reproducible sensor fabrication; make a multi-sensing bar; optimize shape recognition; begin full *in vivo* testing.

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Schedule Updates/revisions:

- Animal experiments for *in vivo* biocompatibility testing will be done earlier than planned, to give feedback for refining material design.

Issues:

- Animal experiments are being performed in Prof. Jim Anderson's lab (CWRU and UH, Pathology Department) according to approved IACUC protocols; no NASA funds are used to cover the expenses.